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was made by two of our countrymen, Messrs. Moore and Beke, and verified by Major Symonds, R.E., and Lieut. Molyneux, R.N.,—followed up by the American government, which sent an expedition at considerable expense across the Atlantic to continue their surveys.

XV.—*Further Considerations on the Great Isthmus of Central America.* By Capt. ROBERT FITZROY, R.N., &c.

Read March 14th, 1853.

IN November, 1850, a Paper on the American Isthmus was read to the Royal Geographical Society, and was subsequently printed in their Journal, vol. xx., part ii., p. 161.

To that Paper it is proposed that this should be supplementary, because, although additional information has been obtained, nothing has yet appeared to invalidate the contents of that compilation; and it will save time to refer to those briefly, rather than incur the risk of unnecessary repetition.

GEOGRAPHICAL investigations are, in themselves, so very interesting, that their possible importance in a rather unscientific though a practical point of view may be less present to the mind of a lover of truthful information (for its own sake) than to the keen eye of enterprise. But such comparative indifference to consequences may be valuable in examining a much disputed question, as tending to promote impartiality.

Interesting and important to the whole civilised world as the Central Isthmus of America has become during the present century, its interest and its importance have been augmented during the last few years in a manner that seems destined to engage a large share of public attention.

Becoming year by year a greater thoroughfare, more and more frequented by increasing numbers of the migratory and enterprising Anglo-Saxon race, by the carriers of mail-bags and merchandise, and by the bearers of gold, the formidable barrier that so narrow a neck of land still opposes to unbroken and direct commercial intercourse is more and more understood and realised.

Scarcely had Asa Whitney tried to divert attention from Central America to his startling project for traversing a Continent, when Australian gold demanded instant and definite attention to a more rapid and better mode of communicating with Australasia—since when increasing demand for rapid voyages, and continual improvements in shipping, have irresistibly encouraged the desire to cut through the Isthmus. A spirit of enterprise that India, China, Peru, and even California, scarcely stimulated, has been caused

by gold in Australia; and now we see keen interest generally taken in some of the various plans proposed. The interest of geographers in the subject is, therefore, increased by the conviction that their unprejudiced examinations may become immediately useful—a stimulus as satisfactory as beneficial.

In the former paper on this subject seven separate lines were reviewed—only one of which appeared to be available as the site of a large ship canal for all nations. Since that time (1850) much valuable additional information has been obtained, which, without at all impugning the evidence then collected, adds so much to some portions of it, that the mind can hardly resist conviction.

The names of Kellett, Barnett, Barnard, Childs, Seemann, Ridley, Mosquera, Cullen, and Gisborne are conspicuous among those who have lately collected really valuable information on the Isthmus, and have made it available to the public.

From a study of the materials afforded by these authorities—very carefully collated and compared with those previously accessible—we may be justified in repeating that there are seven distinct localities on the Great Isthmus between North and South America where a railroad, if not a canal, is practicable. These seven places are in—1, Mexico; 2, through Nicaragua; 3, across Costa Rica; 4, at Panamá; 5, from San Blas to Chepo; 6, across Darien; and 7, by the Atrato and Cupica.

Much as the nature of each of these lines may have been discussed, and trite as the subject may be to many persons, it seems here requisite to recapitulate briefly their principal peculiarities, before examining any one locality more closely, and to recall to mind some few general considerations.

It is now commonly admitted, that a good port at each end of either railway or canal, across the Isthmus, is indispensable. It is also understood and allowed that the more westerly line would (*cæteris paribus*) be comparatively more advantageous to local interests than to those of the whole world.*

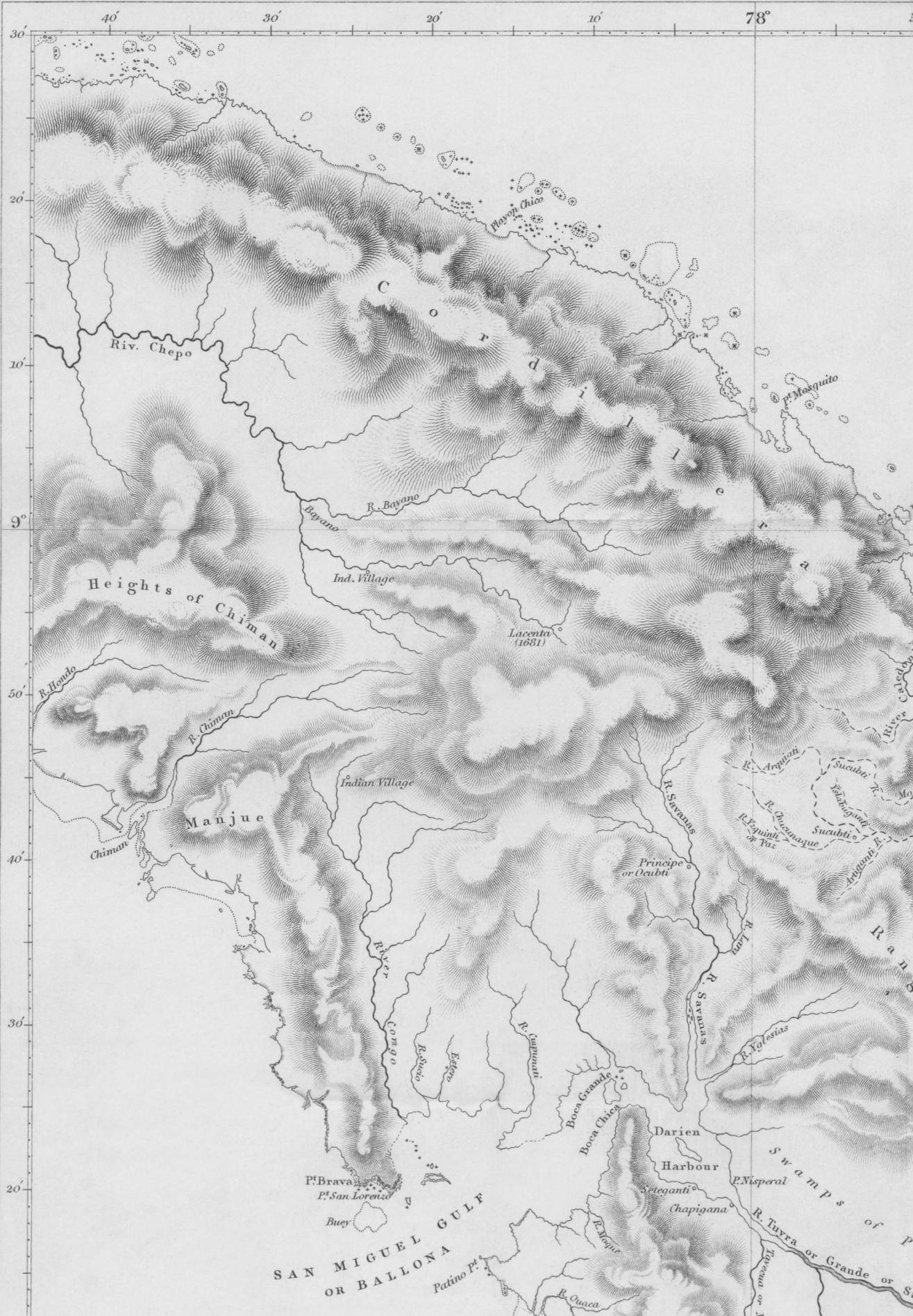
Now taking the lines in geographical order—from W. to E.—we find—

1. That the Mexican line must be nearly 200 miles in length, surmounting an elevation of about 600 feet, and terminating in ports incapable of receiving large ships (ships drawing more than 16 feet of water). Local interests may be greatly benefited by a railroad there, but those of the world cannot be embraced, notwithstanding the elaborate survey of Colonel Barnard.†

2. Canals through Nicaragua will not admit large ships, because neither the seaports, nor those of the lake, nor the locks that will be necessary, if practicable, can be sufficiently spacious and deep,

* Refer to Map.

† Refer to his work.

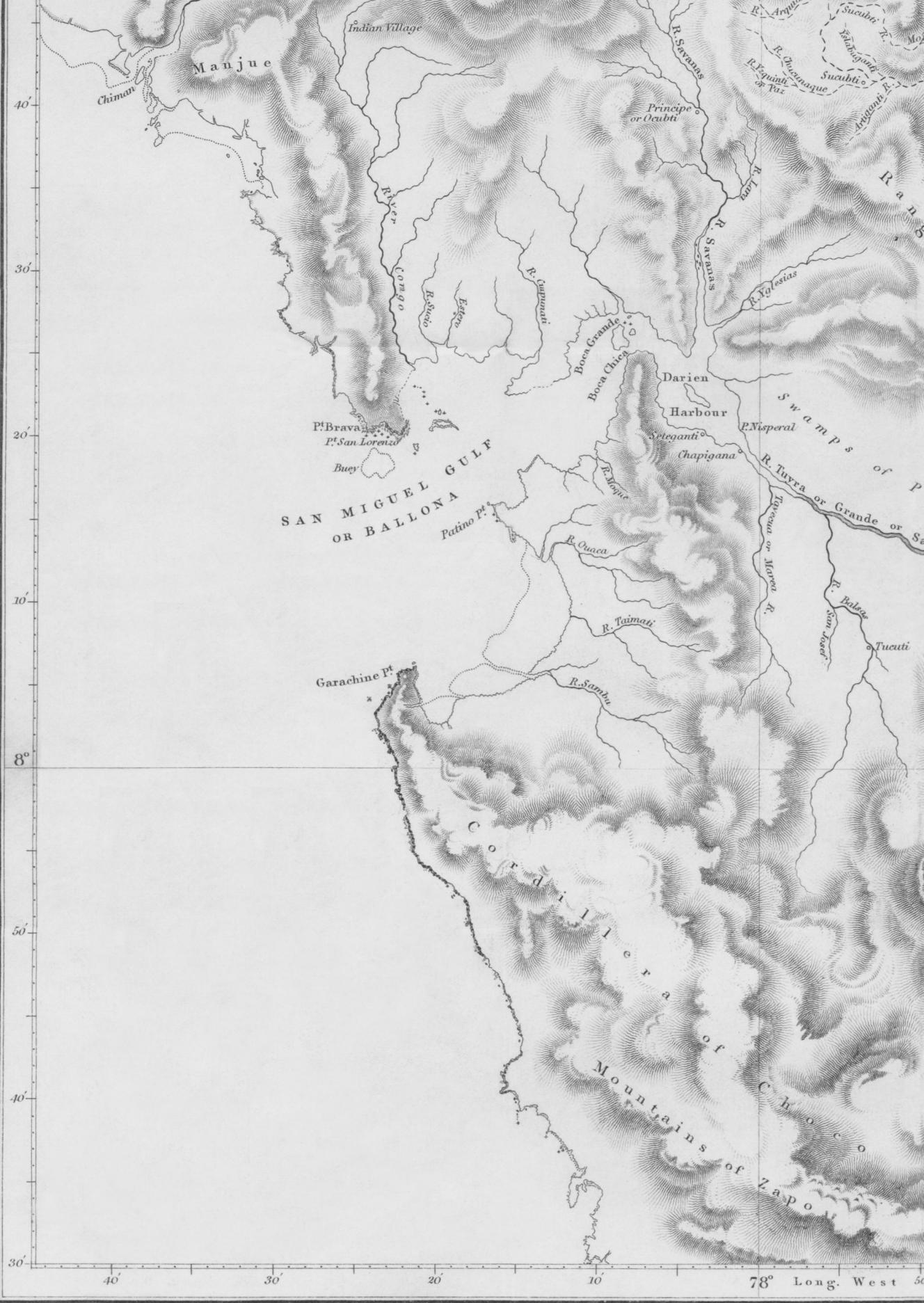


50' 40' 30' 20' 10' 77°
30' 20' 10' 9° 50' 40' 30' 20'

PART OF THE ISTHMUS OF DARIEN

Note. The Coast lines and detail are correct – but the interior – the Mountains, hills, and rivers – are only approximately placed, from old Spanish documents, lent by Mr. Arrowsmith to Captain Fitz-Roy.







because there will not be water to fill them as frequently as will be necessary. The nature of those sea-coasts is against artificial harbours on a large scale. The locks absolutely necessary must be not less than 20 in number, and the length of canals, including canalised rivers, cannot be less than 100 miles.

To make such a river as the San Juan navigable may prove very much more difficult and expensive than to cut a canal. Any combination of railroad and canal would fail to remunerate, while a shorter and better means of transit could be found in another place. Shifting cargo from ship to boat, from boat to rail; thence again to water, in the lake; once more to rail, and then a third time to boat, would be tedious, damaging, and expensive. A continuous railroad would be preferable.

3. Across Costa Rica there are facilities for roads, between excellent ports—the distance being supposed to be 54 miles; the nearest direct being only 40. But as the summit level has not been instrumentally ascertained, it is yet premature to rely on the report of Mr. Norris, Civil Engineer, of Philadelphia, that a line has been found by him,* in which there is no place at a greater elevation above the sea than 160 feet; although the report is sent to us in a printed "Description of a Road across Central America," and is supported by the concurrent testimony of Dr. M'Dowall, of "David" (in Costa Rica, Chiriqui), April, 1852; Mr. J. Whiting, C.E., of David, dated November, 1851; and Mr. William Ridley, C.E., June 22, 1849; besides five responsible gentlemen resident in David.†

Nevertheless the locality is so very favourable; the country is so wonderfully rich, in external as well as internal produce; the sea-ports are so convenient; and the climate is (comparatively) so healthy, that a thorough survey of this line is most desirable. It is here, on the south side, that Gutta Percha is said to be found. Vegetable Ivory‡ is also here, as well as in Choco. Coal exists, in large quantity, on both sides of Costa Rica.

4. Near Panamá the land is said to rise too much to admit of any canal without locks, and access to such a water communication must be inconvenient for want of adequate harbourage.

* Note, Dec. 1, 1851.

† But the *eye-survey* rests on Mr. Norris's *estimation*. This gentleman was engaged as a chief engineer for the preliminary surveys made by the Panamá Railroad Company. Dr. M'Dowall resides at David; Mr. Whiting likewise. Mr. Ridley writes from New York. These gentlemen speak highly of the *coal* on both sides of this part of the Isthmus, and two (Ridley and Whiting) mention the *gutta percha*. Mr. Norris says to his employers, the proprietors of a grant for this route—"I have pleasure in congratulating the proprietors upon holding a privilege far more valuable than either the 'Panamá,' the 'Nicaragua,' or the 'Tehuantepec.'"—"I have no hesitation in giving the preference" (over the Panamá route), "even at the same cost, to the Chiriquí."—*Philadelphia, Dec. 1, 1851.*

‡ See nunn.

A railroad is already in fair progress there—such progress as only “United States” men would have accomplished, in defiance of all obstacles—however, assisted by British capital. It extends nearly half-way across, and may be completed (with one line of rails) in two more years. Unquestionably this railway will be thronged when complete. Even now it is in constant work, as far as it extends (from Aspinwall in Limon or Navy Bay nearly to Gorgona), though there are many long miles of the most toilsome scrambling to go through between Cruces and Panamá, without any kind of alternative as to conveyance.

This railway will require continual renovation in such a climate, a great part being constructed on piles, in swamps, where wood decays rapidly. It may be anticipated that this end of the railway will need reconstruction before the other end and its water termination are completed.

5. The narrow part of the Isthmus between Mandingo or San Blas Bay and the mouth of Chepo river has not been at all explored. The aborigines hold jealous possession of the interior, and do not allow any stranger to cross their territory. They steadily, but civilly, repulse all attempts to view the interior of their narrow domain. As it is said the Indians used to drag their canoes across from river to river,* it seems probable that a summit level, comparatively low, may be found there; but however good may be the port of San Blas, there is no access to Chepo, where a shoal extends about three miles seaward—an obstacle to any harbourage for shipping.

We have thus glanced over the more obvious reasons why no great ship-canal without locks can be formed, with any prospect of advantage to the world generally, in the western or central parts of the great Isthmus, except perhaps in Chiriquí; and there remain only two localities to be considered, namely, the Isthmus of Darien and the river Atrato.

In the paper read before this Society in 1850 (to which reference has already been made), it was said that the “Cupica and Atrato route appears *now* to offer a reasonable prospect of encouragement to undertake the construction of a ship-canal;” and it was then remarked, that “of other *less explored* tracks, the most promising are those between the Gulf of Darien and San Miguel.”

In supposing that the Atrato and Cupica line would be preferable for a canal on the largest scale, it was presumed that the bar of the Atrato would be avoided by a short side cutting; that the Atrato is navigable for the largest ships to near the Naipi;

* See Dampier and Wafer.

and that from such a place a canal might be cut, without locks, to Cupica, the Naipi being used, with other streams, only to feed the canal.

All the reasons for this opinion are detailed in the above mentioned paper: but it may be added here, that, in a letter to Sir Woodbine Parish* (dated Berlin, August 12, 1851), the Baron von Humboldt referred to his early and unaltered opinions about Cupica and the Naipi, and expressed his regret at witnessing the commencement of expensive undertakings on the Isthmus before those places, which were pointed out by him as early as the year 1810 as suitable for such works, had been accurately surveyed.

In passing, allusion should be made to a *recent* statement of a resident in New Granada that Cupica Bay is worthless, and that the ridge of land between it and the Naipi is 1900 feet above the sea—rendering any canal impracticable. As the internal evidence of this gentleman's letter† shows that he mistook the places, and did not examine them closely, if, indeed, he landed at all, this statement, or rather this *opinion*, can have no weight. Humboldt had a plan of Cupica by the well-known Bauza, and we now have that made recently by order of the Admiralty.‡

Since 1850 further attempts have been made to explore the narrowest part of the Isthmus of Darien, between the Gulf of San Miguel and Caledonian Harbour; and their results, although

* "A Berlin. ce 12 Août, 1851.

"Malgré mon âge antédiluvien, j'ai conservé le courage de mes opinions. . . . Je désirerois bien que vous puissiez faire parvenir l'hommage de ma vive reconnaissance à M. le Capitaine Robert FitzRoy, pour la bienveillance qu'il m'a marquée dans son intéressant Mémoire—On the Great Isthmus of Central America—(Journ. of the R. Geog. Soc., vol. xx., part ii., p. 181), à l'égard de mes plus anciennes inspirations sur le port de Cupica et le Rio Napipi. Il croit que j'ai deviné juste. Peut-être le Capitaine FitzRoy auroit il aussi quelque plaisir à étudier le carte très détaillée (de toute la province de Choco) que j'ai publiée en 1827, dans l'Atlas géographique et physique de la grande édition de mon Voyage aux Régions Tropicales (planche 23). Il y trouverait un croquis de la côte de Cupica que je dois à l'habile géographe Espagnol Don Felipe Bauza. Il est triste de voir qu'on hasarde de grandes sommes d'argent, et commence à couper des canaux, avant d'avoir examiné et soumis à des mesures astronomiques et hypsométriques les autres points dont la localité a été désignée par moi dès l'année 1810. La vérité se fait jour avec lenteur.

"Agréez, je vous supplie, Monsieur le Chevalier, l'expression de ma haute considération.

"Votre dévoué et très obéissant serviteur,
"LE BARON DE HUMBOLDT."

† Don Juan de Dios Ulloa, Quibdo, Sept. 6, 1852.

‡ Any one who wishes for more information respecting the Atrato and Cupica line may find the question examined in the twentieth volume of this Society's Journal, Part II., pp. 161-189.

but imperfect, are most important. To say the very least, there is no argument in favour of the Atrato and Cupica line which may not now be urged with greater force in advocating the superior advantages of a line across Darien, the character of that place being so nearly ascertained.

And here let a passing remark be permitted with reference to any possible competition of canals—that the greater opening must become the world's thoroughfare.

When formerly discussing this subject, a strong conviction remained on all our minds that Darien should be surveyed without delay. The illustrious Humboldt assuredly did not state that *he* was “thoroughly satisfied that the Isthmus of Darien is superior to any other portion of the entire neck for a canal” on insufficient grounds. No one can approach the extensive knowledge of Central America, and comprehensiveness of intellect, possessed by the great cosmographer; but as no human authority is *infallible*, let us proceed to examine critically the facts and arguments more *recently* laid before the public in favour of a Darien canal, without locks, for the largest ships in the world.

Some topographical details shall now be submitted which will ask for the special attention of critical geographers.

In tracing, or attempting to trace, the routes of recent travellers in Darien there is extraordinary difficulty, although the locality in question does not exceed a space of 40 miles by 30. Strange to say, the routes of the old bucaniers, of Dampier, Ringrose, Sharp, Wafer, and Davis, the inland journey of that remarkable man Paterson,* and of the Spanish officer Don Manuel Milla de Santa

* Paterson says, “In our passage from Caledonian Harbour, we have six leagues of very good way to a place called Swetee (Chueti?). From Swetee to Tubuganti we have between two and three leagues not so passable, by reason of the turnings and windings of the river. At Tubuganti there is ten feet of high water,” &c.

Paterson visited the Indian Cacique, ten days' journey from Caledonia Harbour, with Capitan “Andreas” (probably at “Ponca”). See Wafer.

Bucaniers of America.—*Voyage of Captain Sharp.*—“We marched at first through a small skirt of a wood, and then over a bay almost a league in length. After that we went directly up a woody valley, where we saw here and there an old plantation, and had a very good road to march in. There we came to the side of a river, which in most places was dry, and built us houses, or rather huts, to lodge in. (Anachacuna?)

“The next day of our march we mounted a very steep hill, and on the other side, at the foot thereof, we rested on the bank of a river, which Captain Andreas told us did run into the South Sea, being the same river on which the town of Santa Maria was situated.

“Hence we continued our march until noon, and then ascended another mountain, extremely higher than the former. Here we ran much danger oftentimes, and in many places the mountain being so perpendicular and the path so narrow that but one man at a time could pass. We arrived by the dark of the same evening

Ella,* can be followed on the old Spanish maps, but not in our modern ones, even the best; while there are no data hitherto published that afford more than a guess at the tracks of modern explorers after leaving the sea-coast. Mr. Gisborne has compiled, or rather copied, the principal part of the map, on which he has shown, *in red*, those portions which he himself saw and was enabled to lay down. No surveyor who reads his Journal and Report can doubt that he has given eye-sketches, aided by compass bearings and estimated distances; but the estimation of a practised eye is not to be undervalued. Dr. Cullen can be traced up the Tuyra to Yavisa, and up the Paya; also up the Savana, but no farther inland.

The state of our geographical knowledge of that exceedingly interesting region is the following:—

All examinations, all surveys, of the Great Isthmus were made by Spain alone, while she held the country (till the years 1821-31). Very good maps of much of the Spanish territory existed at that time: but they have been copied and recopied by all manner of hands; scales and bearings have been altered, not intentionally, but by mistake; names omitted or mis-spelled; and absolute longitudes applied erroneously. Thus good original work came to be so deteriorated by its transmutations as to be almost useless.

No surveys need be better than some of the Spanish works

to the other side of the mountain, and lodged again by the same river, having marched that day, according to our reckoning, about 18 miles.

"The next morning we marched all along the river afore-mentioned, crossing it often, almost at every $\frac{1}{2}$ mile—sometimes up to the knees, and at other times up to the middle, in a very swift current.

"At the distance of $\frac{1}{2}$ a mile from this place lived the king or chief captain of these Indians. About 9 we continued our march along the banks of the river above mentioned.

"The next day about eighty men embarked in fourteen canoes to go down the river. At the distance of almost every stone's cast we were constrained to quit and get out of our boats, and hale them over either sands or rocks; at other times over trees that lay cross, and filled up the river, so that they hindered our navigation—yea, several times over the very points of land itself. That night we built ourselves huts to shelter in upon the river side, and rested our wearied limbs until next morning. This being come, we prosecuted our journey all day long with the same fatigue and toil as we had done the day before.

"The next day the difficulties of the way were intolerable. That night we rested in huts.

"The next day we continued our navigation down the river, and arrived at a beachy point of land, at which place another arm joined the same river. Here the Indians rendezvous.

"We departed thence early the next morning, the last day of our march. Unto the point above mentioned the Indians had hitherto guided our canoes with long poles or sticks, but now we made ourselves oars and paddles to row withal, and thereby make what speed we could. About midnight we arrived and landed at the distance of $\frac{1}{2}$ a mile, more or less, from the town of Santa Maria.

"The river at Santa Maria is twice as broad as the Thames is at London, and floweth above threescore miles upwards, rising to the height of $2\frac{1}{2}$ fathoms at the town itself."—*Buccaniers of America*, 1695, Part IV. p. 12 (*Sharp's Voyage*).

* March 13, 1788.

undertaken towards the end of the last and during the beginning of this century. Methods and instruments were used by Tofíño, Malaspina, Espinosa, Bauza, Córdova, and others, that were not adopted if known by French or English surveyors until afterwards. Triangulation without the compass, bases obtained by angular measurements of known objects,* and the most perfect style of plan-drawing, on true principles, were practised by Spaniards before this century commenced.

The south coast of the Great Isthmus and the interior of Darien were not explored and mapped sufficiently, because of the hostile Indians, and political reasons connected with the gold-mines in that district. There was also another source of error in that particular vicinity which has only recently been eliminated, namely, the great difference of longitudes, according to the maps, between places on opposite sides of the Isthmus which are really in the same meridian. This amounted to more than 30 miles along all the coast from Chiriquí to Darien with respect to the corresponding southern coast-line.

Thanks to the far-seeing and indefatigable Hydrographer to the Admiralty, Admiral Sir Francis Beaufort, the British surveys have included much of the coasts of Central America, and they are now placed in relatively correct positions on our latest maps. Having therefore exact coast-lines, or boundaries, we can avail ourselves more readily of much Spanish interior detail; but it is exceedingly difficult to get at the *original* works.

A very neatly engraved and *apparently* complete map of the Isthmus has been lately published at New Orleans by Dr. Autenreith, but in reality it is only a copy of Spanish documents and recent surveys made by England—it is not an original work. There are in this country at present more materials for a map of Darien than exist elsewhere. Bauza brought copies of all the Spanish-American documents to this country, with many original maps; but there is still a great extent, nearly all the interior of the Isthmus of Darien, unexamined by the eye of a surveyor.

In the last century (1780) a Spanish party of five engineers and surveyors, under Donoso, escorted by a large body of troops,† was stopped by the Indians in the Chucunaque river, and obliged to return without executing their orders to survey the region near Caledonian Harbour; and *this* was the *last* attempt by Spain, or by *any one*, to make a regular survey of the interior of that part of the Isthmus.

In the valuable collection of Mr. Arrowsmith are many Spanish

* Masthead angles were taken in Córdova's Voyage, 1785-6.

† Four hundred.

documents, among which one plan, dated 1774, shows all the Spanish establishments, military and religious, as well as mining, at that date, in Darien. Others show details of a previous century, and a few give the earliest settlements of the 16th century.

And here allow one word to be said of the injury to *truthful* geography caused by copying old materials without acknowledgment, or by adding imaginary topography without explanation. The map by Dr. Autenreith has much the appearance of an exact survey; there is no distinction made between those parts for which there is authority, and those which are partly the results of imagination (the interior hill work).

The public in general being unaware of the *authorities* for a map, the mere copyist is often supposed to be the *author* of the work. Maps or charts that are not original ought always to show from what data they have been compiled.

In order to assist in now forming a correct opinion of Darien, a retrospective historical glance at a few points is necessary.

The first settlement in all America was founded in 1509 at the mouth of the Atrato. It was called Santa Maria el Antigua. The next settlement on the Isthmus was at Acla, or Agla, in 1514, a few miles inland * from that port or bay now famed in history and romance, called by Paterson Caledonian Harbour. It was from Agla that Balboa crossed to the South Sea, and that the earliest expeditions to Peru were despatched.

In 1532 these two settlements were abandoned, and their population transferred to Nombre de Dios and Panamá. This is said to have been done on account of the unhealthy site of Santa Maria el Antigua, surrounded by marshes and mangrove jungles; but why Agla was abandoned does not appear, except by Paterson's narrative, whence it may be inferred that the settlers there were harassed by the Indians, and were too far from the sea shore. Besides which, as intercourse increased with places on the Pacific coasts, it became, no doubt, more convenient to have a principal rendezvous on the southern shore, more accessible from the Pacific.

In those early days so famed was Darien for gold, that the province was called "Golden Castile"† (Castilla de Oro). It was the principal portion of that "Tierra Firme," so famed afterwards as the "Spanish Main," the real "El Dorado" to which Sir Walter Raleigh went in 1517-8, Sir Francis Drake in 1557, troops of Bucaniers in the seventeenth century, and the Scotch Colony in 1698.

* Five leagues from the shore.—Sp. MS.

† The arms of Santa Maria el Antigua were a *golden castle* between a jaguar and a puma.

Repeated aggressions on this auriferous district, where abundance of gold was procured by black slave labour, after the aborigines had been diminished in numbers by oppressive cruelties, induced Spain to close and abandon the mines for a time (early in the eighteenth century)—even those famous ones in the mountains of Espíritu Santo, near Cana, from which alone more gold went through Panamá in a year than from all the other mines of America taken together. These Cana mines were sacked in 1702 and 1712 by English, in 1724 by French, and by the Indians in 1727. Nevertheless in 1774 the mining operations were again going on, having been re-established a few years previously.

When Cana was taken by the expedition (as narrated by Davis) sent from Jamaica, by Colonel Beckford, in 1702, there were about “900 houses” (probably most of them mere huts): therefore the population could hardly have been less than 3000 at that time. From 1719 to 1727 there was a great and general resistance of the Indians, who attacked the Spaniards in all directions, and drove them out of all the detached settlements. Some years afterwards peace was made (in 1740), missions of the Jesuits advanced among the natives, and by their aid not only much topographical knowledge was acquired, but Spanish settlements in the interior were renewed and mines worked.* But the Indians again rebelled: therefore small forts were re-established at Yavisa, Molineca, and Santa Maria Real; with a new post (in 1780) at *El Principe*, or Ocubti, from which a road was cut by Arisa, leading towards Caledonian Harbour. The fort “*El Principe*” does not appear in the Spanish MS. map of 1774: it was built about 1785, when the Spaniards had again advanced into the interior Indian territory.

In 1788, Milla de Santa Ella, an officer of Spain, went from Caledonian Harbour to *El Principe* direct by the road then recently opened by the Spaniards; but as he did not think it advisable to return the same way, he went down the Savana, and up the Chucunaque to the Tubuganti and Chueti rivers, whence he crossed to his station at Caledonian Harbour by the same route, undoubtedly, that Paterson traversed on his visit to the Indian great Chief at Ponca, in 1698.†

* The Jesuits were expelled in 1767.

† 1788, March.—“Sunday, the 2nd of the present month, I left Carolina at 6 A.M., accompanied by the Indian Suspani, captain of the village of Sucubti, and two of his comrades, with the linguist, commencing the journey by following up the waters of the Aglatomate, with many and repeated crossings, until we arrived close to the Cordillera, where the Indians of Chueti have a small house that serves as a hostelry to the above-mentioned Indians and those of Sucubti, who are the usual traders to Carolina by this road. From Carolina to this place the distance is $2\frac{1}{2}$ leagues, little more or less. Upon arriving at a place they call the Two Mouths, it is necessary to follow that on the right hand, which in the dry season is quite dried up; and the better to know the place, one will meet an Indian shed covered

In 1790, a treaty of peace was concluded between the aborigines and the Spaniards in Darien, at which time the garrisons were withdrawn from Caledonian Harbour, Principe, and other places;

with plantain leaves, and at a little distance from this, in the line of the Cordillera, will be seen a smaller hill (elevation?) than those (that?) to the right. Up to this there will be found water in this branch of the river, which has in some places a bottom of sand, and in others of shells, whilst higher up there are stones and pebbles. Taking care, after recognising these marks, to keep to the right of the river, the path or trail leading to the above-mentioned hostelry, which is from 16 to 20 yards from the river, will be found: from thence the road over the Cordillera, from N. and S., cannot be missed, since, after crossing three or four small rivulets, or rather crossing the same one three or four times, with a little care a broken bank will be found on the right hand. This is where the path over the Cordillera commences, and it is as wide and trodden as if it were made by our people (Spaniards). The whole ascent is rather steep, and half-way up a fallen trunk of a tree stops the path. From this place may be seen the sea (Pacific?) and Carolina.

“ Following the path to the right, and avoiding that on the left, which leads to Chueti, the mountain is crossed, the descent of which on the other side is more gradual and sloping. At its foot the River Forti (Morti or Moreti?) unites with the Sucubti. Following the Sucubti down to the S., after two or three hours of a good road, a plantain ground and a very small hut will be found; in half an hour another, both on the right hand; and in another hour a third, on the left hand side. $\frac{1}{4}$ league lower down, on the left hand, will be met another, larger than the rest. In this house I stopped to rest, having arrived about two o'clock (P.M.), and, after resting awhile, I proceeded by a road which is at the back of it; and ascending a mountain, the path over which cannot be missed, it is so beaten, I descended again to the river, which has here many rocks.

“ Taking care not to lose sight of the river, there will be seen, first, an Indian hut, then another, and then the village of Sucubti. This village consists of six houses together—those above mentioned—and two or three lower down. It may have about thirty Indians capable of bearing arms, a few more women, and sixty children.

“ Monday, 3rd.—I stopped at this village all day.

“ Tuesday, 4th.—I started at daybreak, accompanied by the captain and two of his Indians, and followed down the river over level ground, and through an open forest; and about 10 A.M., after having proceeded about 2 leagues, we left the river altogether, following a path to the left. All the rest of this day we walked through a forest exceedingly level and open; here the Indians of Sucubti hunt, on account of the abundance of all kinds of game. At about $5\frac{1}{2}$ P.M. we halted at a rivulet, which had scarcely water enough to satisfy our thirst.

“ Wednesday, 5th.—We pursued our journey through the same forest, and at 10 o'clock we again fell in with the Sucubti. As soon as we arrived at this place, the chief told me that we could not proceed till some Indians should come with their canoes, to carry us down a short distance to the road that the Spaniards had opened (Arisa's road).

“ Thursday, 6th.—Four canoes arrived with eight Indians, who, as I understood, were allied with the rebel Chucunas; and I found they were not of those who had entered into the peace with us, but were always watching to attack any of our people who might stray into the bush from the establishment of Port Principe. At 10 A.M. we embarked on the river, and about 2 leagues lower down we halted at the road that they call Arisa's.

“ Friday, 7th.—At daybreak we proceeded along the road opened by the Spaniards, and after 3 hours' walk we crossed the Chucuna River by a bridge, and arrived at the island where Don Luis de la Carrera was (lately) encamped. Here we found tracks and recently-erected sheds of the Chucunas, whereat (the chief) became alarmed; and to conduct me the more safely, he went before with the other Indians, I following a good distance behind until we passed the other branch of this river, lately named La Paz.

“ About

Yavisa then becoming the seat of local authority, as it has since remained. From the time Spain lost her American dominions, New Granada has included Darien ; but the Aborigines have held their ground on the Isthmus. No mines have been regularly worked. A few gold-washers only have frequented the rivers in the dry season. The very sites of villages, and the actual localities of mines, have been overgrown by the thick underwood of tropical vegetation, and, except by tradition among the Indians, their places are forgotten.

So much has been published lately about the unfortunate Scotch Colony, that, however interesting the subject may be, only one or two remarks shall be here made in passing.

Paterson, its originator and founder, had himself visited the West Indies, was personally acquainted with some of the Bucaniers, and had gathered a great deal of information, especially from Wafer. He had acquired ample local information before he undertook his great enterprise. His was no wild or vague speculation, though unsuccessful. It was the creation of the same mind, of the same original genius, that planned and founded the Bank of England. But his Darien enterprise had inherent and radical defects, which chiefly caused its ruin. He invaded a country claimed by Spain, then at peace with England ; he had no commission from his Sovereign to act hostilely ; and there was no settled organisation with respect to conduct and discipline among the colonists. Whatever harsh orders or cruel disappointment took effect, it was not to the jealousy of the East India Company,

"About 5 in the evening I had the felicity to arrive at Puerto Principe, where the said chief (Suspani) advised that we should return by the river Savanas, Chucunaqua, and Subganti, coming out at the village of Chueti, a short day's distance from Carolina, which plan appeared the best to Don Andres de Arisa, Commandant, who considered it attentively.

"10th.—I proceeded on my return back by the route above mentioned, and was two days on my way to Yavisa, as we only went when the tide permitted. (Chucunas Indians having followed their tracks, Suspani alone went forward to the mouth of the Subganti, and thence to Carolina, with the dispatches. Milla returned to Principe, and thence by way of Panama to his station at Carolina.)"—*Cullen's Darien*, 2nd edition, 1853, pp. 193-7.

In a diary signed by Antonio Velasquez, at San Fernando de Carolina, mention is made (Dec. 30, 1787) of the Indians of the Chuquanaqua being still rebellious, though willing to enter into the peace; from which it may be inferred that they and the Chucunas Indians above mentioned by Milla were the same tribe, and that the river Chucuna is the Chuquanaqua.

The route proposed by Arisa, from information given to him by Suspani, and the same by which Suspani guided Milla, was to ascend the Aglatomate one hour; then to ascend the ravine of the Cordilleras to the head waters of the Sucubti, an eight hours' journey; then to go down to the Chuquanaqua, half a day by water and one day by land, and turning to the right for six hours, over ground quite level, to reach Principe.—*Cullen's Darien*, 2nd edition, 1853, p. 49, 50.

alone, that the Scotch Company should have attributed their failure and extraordinary disasters.

It is remarkable that, although the first and second expeditions of the Scotch to Darien failed miserably, there was still so strong a desire to persevere, even among those who had suffered very severely, including Paterson himself, that a third enterprise was undertaken (by the gallant Campbell, of Finab), which was subsequently expelled by an overpowering Spanish force that invested the place by sea and land. The squadron came from Cartagena ; but the land forces from Panamá, *across the Isthmus*.

A halo has lately shone around the Scotch enterprise, in consequence of the interest excited by the work of the justly lamented Eliot Warburton, called "Darien." So keenly had that author himself entered into the subject, that he was actually about to explore the mysterious barrier personally, when lost in the Amazon, mail steam-ship.

The examination of no traveller, except Humboldt, previous to 1850, induced a belief that a canal might be cut directly through Darien. Dr. Cullen's personal inspection of Caledonian Harbour, and of the Savana river, with their neighbourhood, added to the information he obtained orally and by reading, led him to the conclusion, that the lowest summit level between those places did not exceed 300 or 400 feet, while it might be very much less. Feeling so confident that a lower level existed, he went there again to explore ; but while collecting further information and arranging preliminaries, at Bogotá, the seat of Government in New Granada, Mr. Gisborne (an engineer employed by Messrs. Fox and Henderson) made short excursions from each side of the Isthmus, which satisfied him that the lowest summit level does not exceed 160 feet above the sea.

According to the most authentic map of this district, Mr. Arrowsmith's last printed, not yet published, the distance across in a direct line—between deep water on each side—is about 33 miles. The windings of a canal may require nearly a third more, and, if so, the whole distance to be canalised is about 40 miles ; *a shorter distance than can be found elsewhere*.

It is to be regretted that Dr. Cullen has not yet published any sketch of *his* tracks across the Isthmus of Darien. He stated, in a letter to the 'Times' (of February 16, 1853), dated February 14,

" Not satisfied with crossing the Isthmus once only in 1849, I returned again from the Atlantic to the Pacific, having cut a *picadura*, or track, for myself, through the bush, from Port Escocés to the river Savana, which I navigated always, except on one occasion, alone ; paddling myself in a small

canoe. In 1850 I again crossed and recrossed this part of the Isthmus; and again, in August and September, 1851, I, at different times, and in different lines, crossed from the Savana river to the sea-beach on the Atlantic."

Of such repeated explorations in so interesting a district, we have not yet been favoured with the details and itineraries. In trying to trace some of these journeys, we are stopped by perplexing doubts. But we owe Dr. Cullen much for valuable information gleaned from archives, maps, books, oral accounts, and his own personal observation. He was certainly the originator of the statement in 1850, that between Caledonian Harbour and the Gulf of San Miguel, a comparatively low summit level exists. We owe him too much for these important benefits to criticise unnecessarily. Not only has Dr. Cullen's statement been corroborated by Mr. Gisborne, but a much lower summit level is said to have been discovered, one not exceeding 160 feet, while it seems probable that point is not the lowest.

Mr. Gisborne's examination of the principal features of this line across Darien, however incomplete, is a material advance towards certainty. We have his two bases of operations, at Caledonian Harbour and San Miguel (entrance), nearly determined by recent Government surveys, and we have his character as a guarantee for the value of those details which he has given in his "Report." There may be a few miles of distance to settle, and there may be doubts whether the river near his watershed, or summit level, called by him *Caledonia*, may not be another river, perhaps the Chucunaque, or one of its tributaries; and, moreover, that the range of heights supposed by him to separate those rivers is not truly placed, while his river Caledonia (otherwise the Golden river, or Aglatomate) winds through a more northerly area. But these are trifles compared with his barometric measurement of the summit level, and his own overlapping eye views of the country which he did not traverse.

If indeed the mouth of the Savana be not accurately laid down, or assumed by him; if it be much farther west than he supposed, his surveys may not have overlapped; and he may have looked across two different plains; in which case there may be yet another ridge or watershed between the rivers which he actually touched. The expedition employed by our Government to survey this coast did not examine the mouths of rivers running into San Miguel. Only the western part of that gulf was examined, in continuing the coast line. Hence the position of the Savana may be less accurately known than is generally supposed.

It is hardly necessary to remark here that to make independent observations for latitude, longitude, distance, and accurate

triangulation, requires more time and instruments than can be carried in a hasty scramble through a wild country.*

Mr. Gisborne's examination of the geology and mineralogy is valuable. Far from discovering any remarkable impediments to cutting a canal, he states that there are *no* particular engineering difficulties with respect to the *ground*, that there is much stratified shale-rock, easy to quarry, and fit to line a canal. There is abundance of fine timber. Mangrove forests, rather than jungles, surround the waters of the gulf. Densely matted underwood follows on drier ground ; and then, on the elevated country, there are magnificent timber-trees very little encumbered by under-wood.

Having thus endeavoured to take a general view of this question, we may perhaps ask ourselves what are the greatest impediments to the excavation of a canal—impediments exceeding those that would attend any corresponding work in Europe ?

Supposing that political arrangements are satisfactorily completed, the claims of other parties compromised or barred, and adequate funds disposable, the only peculiar and important impediments will be two—the natives and the climate. The native or Indian question, as connected with the independence and rights of the aborigines, should be considered deliberately. That the Indians may be overawed and conciliated by proper management there is no doubt ; but their reasonable claims must be satisfied, irrespective of all jurisdiction assumed over them by New Granada—a jurisdiction which the natives of Darien repudiate. Fair dealing, while an overpowering force is in sight, will prevent any attempt to have recourse to arms, or to molest the parties employed about a canal, and would therefore obviate any irritating and probably prolonged guerrilla hostilities.

* " Hydrographical surveys are always tedious and laborious, but they are peculiarly so on a coast like that of New Granada, where heavy showers of rain are followed by the sudden appearance of the sun, and noxious vapours which such exchange produces ; where muddy mangrove swamps, swarming with alligators and generating unhealthy miasmata, line the shores for miles together ; where in some places musquitos are so numerous, that the surveyor requires more than human patience to endure the stings to which he is subjected ; and where the nights are so hot and oppressive, that sleep is sought in vain.

" A chart may seem to be very simple to those who are not aware of the skill, diligence, and expense required to complete it ; but those who have watched its progress, and the amount of labour required to finish even a small piece of such a delineation, look upon it with different eyes, and are able to appreciate the vast treasures which the Hydrographical Office, by its publications, is constantly offering to the public.

" We carried on our surveying operations along the coast of Panama and Darien until the rains, towards the end of April, began to be so incessant, that we were compelled to discontinue our task, and go back to Panama."—*Seemann*, vol. i. p. 139.

It is estimated that there are about 5000 independent Indians on the Isthmus E. of Costa Rica. Of these it may be presumed that there are not 2000 capable of bearing arms; a small number when dispersed in the highlands between Costa Rica and Choco, but quite enough to molest small parties of workmen very seriously.

For defensive purposes, as well as for the general order and discipline of very large bodies of labourers, in a wild country, some degree of military organization and an acquiescence in military discipline would seem to be indispensable.

Whether convicts might be employed advantageously may be a subject for grave consideration. In clearing the wood of a tropical forest, and exposing ground to the sun's rays for the first time, much pestilential sickness may be caused, as has been repeatedly proved (at Pulo Penang, Fernando Po, and many other places). It cannot be doubted that convicts would be peculiarly liable to the influence of such diseases, and therefore it might be unwise to make such an experiment. Natives of tropical climates, or Chinese, would probably be able to stand the malaria of newly-cleared ground far better than Europeans.

The most formidable, because permanent and irremediable, obstacle is unquestionably the climate. There is no doubt that rain prevails about two-thirds of the year even on the higher grounds of Darien, while it is no less certain that in the Gulf of San Miguel (where mangrove jungles bound low muddy shores, and the great fall of tide exposes extensive mud banks) there is a continued succession of rains, more or less heavy, except during short intervals. Examine any travellers' accounts, read their narratives—they themselves bear witness to the undeniable fact, although in *general* terms they may say there is not *so much* rain, and it is not *so unhealthy* as has been supposed.

Many Europeans state they did not suffer, although much and continuously exposed to the rains and heat. Active and temperate men have not found the climate very detrimental. Persons who have had many years' experience there assert that care and regularity will ward off such attacks of fever or dysentery as are common among thoughtless Europeans unaccustomed to tropical regions.

It is possible that the great rise of tide on the S. side of the isthmus may tend to purify the air on its shores, and this effect, in such a place as San Miguel Gulf, may be very beneficial.

On the Atrato—at Chagres—at Portobello—and other notoriously unhealthy places, there is little or no rise of tide; and the air among the mangrove jungles becomes at times pestilential. Seemann, in his ‘Voyage of the Herald,’ recently published,

gives so correct a description of such places, that it deserves attention. He says (vol. i. p. 249),—

“The sea-coast, and those parts influenced by the tides and the immediate evaporation of the sea, produce a quite peculiar vegetation, which is generally characterised by a leathery, glossy foliage, and leaves with entire margins. In all muddy places, down to the verge of the ocean, are impenetrable thickets formed of mangroves, which exhale putrid miasmata and spread sickness over the adjacent districts. Occasionally extensive tracts are covered with the ‘Guagara de puerco,’ its fronds being as much as 10 feet high. Myriads of mosquitoes and sandflies fill the air. Huge alligators sun themselves on the slimy banks, lying motionless, blinking with their great eyes, and jumping into the water directly any one approaches. To destroy these dreaded swamps is almost impossible.”

Again (p. 251, 252) he says,—

“Forests cover at least two-thirds of the whole territory. The high trees, the dense foliage, and the numerous climbing plants, almost shut out the rays of the sun, causing a gloom which is the more insupportable as all other objects are hidden from view. Rain is so frequent, and the moisture so great, that the burning of these forests is impossible.” “From reading the highly coloured accounts with which many travellers have endeavoured to embellish their narratives, the European has drawn, in imagination, a picture of equinoctial countries which a comparison with nature at once demolishes.”

Speaking of the “vegetable ivory,” and referring to the climate, Mr. Seemann says (p. 222),—

“It grows in low, damp localities, and is diffused over the southern parts of Darien and the vicinity of Portobello, districts which are almost throughout the year deluged by torrents of rain, or enveloped in the thick vapour that constantly arises from the humidity of the soil and the rankness of the vegetation.”

Describing the appearance of one of these mangrove forests, as they may be called, the same author observes (p. 73):—

“The trees were actually in the water. The tall mangroves, with roots exposed for 12 or 14 feet, formed a huge tangled trelliswork, from which the tall stems rose to a height of 60 or 70 feet.”

Much may be done towards the preservation of health, as well as personal comfort, in such regions, by erecting extensive temporary sheds—on a wide scale—over places where work of any kind is going on. Materials for such sheltering roofs are abundant, and to be had for the cutting.

The effects of such a climate must, of course, increase the expense and diminish the durability of all engineering works. The process of “unwatering,” as well as excavating, must be impeded to an extent that engineers in England can hardly realise in their estimation, unless they have witnessed a tropical rainy season, with its effects upon man and his operations.

By apportioning work according to the seasons, and keeping men regularly but cautiously employed, under shelter from rain or sun as much as possible, the difficulties attendant on the nature

of the climate may doubtless be overcome considerably. Any amount of shelter from rain, and any number of fires, can be easily provided in a country where wood is a positive encumbrance—absolutely a nuisance.

By clearing and burning, the climate may be improved, insects and noxious creatures scared away or destroyed, and the surface of the ground prepared for beneficial cultivation. But the fact must not be lost sight of, that the first exposure of ground to the sun in low latitudes has often been attended with the generation of fatally pestiferous malaria.

Great works *have* been effected on the Isthmus in times past; there are more powerful means of execution *now*. From the “*Desague*” and the *Pyramids* we may turn to the Panama Railroad, and reflect that the resources of the world are at the command of British capital.

In concluding this sketch, already too long for the allotted time, but too brief and imperfect to do justice to the important question of which it is a mere outline—only a few more remarks, even of a general character, can be permitted.

In deciding on the dimensions of a ship-canal, it will be necessary to allow width for the passage of the largest ships in opposite directions, and depth enough to ensure their floating at all times, even when some amount of detritus may have been swept into the cutting and there temporarily accumulated. Such dimensions should not be much less than 200 feet wide, and 30 feet deep, at the northern entrance, nor than 300 feet in width, and 50 feet in depth, at the southern termination.

Mr. Gisborne's estimates (pp. 28, 29; Journal, p. 231, Report) refer to a somewhat different hypothesis, one that seems not strictly reconcilable with the case; and the engravings of his sections in the *first plan* have not perhaps been corrected by himself, as they show the tide-levels somewhat incorrectly, on the Atlantic side. The supposition above referred to as described by Mr. Gisborne, is that the canal will have a horizontal bottom, and that there will be about 11 feet greater depth at one end than at the other. Now it appears certain, that if a canal, every where 30 feet deep at low water, open at one end into a sea where there is very little variation in the level, and at the other into an ocean which rises and falls about 20 feet, the mean level of both seas being nearly the same, there must be a depth of 50 feet from high-water-mark to the bottom at one end, and 30 feet at the other; the bottom of the canal being not horizontal, as Mr. Gisborne supposed, but

having a gradient, or gradual slope or rise of about 10 feet in the length of the canal. This will materially affect the estimates.

The peculiarity of the tides would somewhat resemble that of the Narrows, in the east entrance of the Strait of Magellan, where the tides of the Atlantic encounter those of the Pacific Ocean in a very remarkable manner, making high water or full sea at one and the same time (nearly), yet rising and falling 7 fathoms on the one side, and only 1 fathom on the other. Of course rapid streams are caused each way—very useful to navigators.

However theoretically true may be the mathematical results obtained by Mr. Gisborne, aided by Professor Stokes, from the data assumed, it may be premature to rely on any calculated degree of velocity in the current caused by tidal action through such a canal; because the windings cannot yet be determined, nor the length of the canal, on which will depend the amount of friction, and the consequent retardation of the movement of water from one direction towards the other. It does not appear improbable, that when once a free passage is opened from sea to sea, the tidal action will cause a more rapid current, and therefore a greater scour, than is anticipated. Such an effect would be highly beneficial, provided that the bars, certain to be caused near the entrances, be duly foreseen and guarded against, or cleared away, as they grow.

A peculiar *advantage* connected with the Gulf of San Miguel deserves notice.

There is no port in the Central or Southern Pacific Ocean in which docks for large ships could be constructed with less difficulty, except from climate, than in that particular locality. Great rise of tide, spacious harbourage, abundance of timber and stone, cheap provisions, and any number of American, or Chinese, labourers are the special facilities. It should be considered that there is no frequented port in the Pacific Ocean, between the tropics, or in the Great South Sea, where the tide rises sufficiently in a good harbour to admit of the construction of a large dry dock (without the aid of expensive steam engines), and that there is actually no dock for a large ship on that side of the world, except one, now nearly completed, at Sydney. It is scarcely necessary to observe that each succeeding year renders the want of dry docks in the Pacific more keenly felt, because the number of large steamers increases so rapidly.

Any such docks should be surrounded, not covered (unless at a considerable height), by ample roofing, so that all works necessary might be carried on irrespective of the weather. The utility

of such an undertaking would be so great, that undoubtedly the projectors of the “Gigantic Canal” will not omit to plan docks on a scale corresponding.

We can hardly quit this subject without referring to the claim made by the Panamá Railroad Company to bar all other parties from effecting any means of transit across the Isthmus included in New Granada. According to the old Spanish boundaries, as shown in numerous maps, the province of Panamá is separate and distinct from that of Darien; but the Government of New Granada have nevertheless caused their deed of grant in favour of Messrs. Fox, Henderson, Brassey, and Cullen, to be so worded as to save the claims of some other grantees, and thus to leave open a source of detrimental litigation.

A French Company has lately obtained a grant to work gold-mines on the Marea river, and, among other parties, are earnestly striving to monopolise the Cana district, whence so much gold was carried formerly.

An accurate and complete survey would soon show the real basis on which an ample amount of capital might be invested securely; and then, if as satisfactory in its results as is anticipated, there will be the strongest grounds for reasonable encouragement and support from Government.

Publications of ascertained value, and numerous other authenticated statements, have teemed with statistical accounts, arguments, and nautical calculations, which it would be as tedious as unnecessary here to recapitulate in detail. It will now suffice to say, that if such an inter-oceanic communication can be completed, it will immediately be used, not only by all ships bound to Western America (N. and S.) as well as by all the Australasian commerce, but by the whole of the China trade, and a considerable portion of that with eastern India. It will not be a question solely of distance, but of avoiding the Cape of Good Hope, as well as Cape Horn, and making the whole passage, out and home, in comparatively fine weather through seas seldom dangerous.

It is impossible to overrate the importance of this immense enterprise—this proposed intersection of the Darien Isthmus.

Having thus endeavoured to make a fair comparison between the peculiarities, geographically considered, of seven sections of the Great Isthmus of Central America, and to show which of them may become the best site for a ship-canal, let us conclude by expressing an earnest hope, that the great maritime powers will unite in guaranteeing the political security and absolute neutrality of an undertaking so universally beneficial.
